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Constant effects and the independence of variants in controlled judgment data *

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Abstract

This article proposes that Kroch's (1989) Constant Rate Hypothesis—the generalization that contextual effects tend to be stable in processes of diachronic variation in production data—be extended to synchronic variation in controlled judgment data. Two recent, large-sample judgment experiments are discussed suggesting that shared contextual effects across speakers in acceptability judgments can be used to infer a single abstract source for patterns of variation across superficially different contexts. At the same time, the results suggest that not all sets of variants—or "ways of saying the same thing" (Labov 1972: 271)—are linguistic variables of this formally-defined type.

Keywords: variable, variant, constant rate hypothesis, syntax, change, competing grammar, particle verb, ditransitive

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1. Introduction

An important accomplishment of modern diachronic syntax has been the discovery of a generalization, originally due to Kroch (1989), about the stability of contextual effects on variation in processes of syntactic change as manifested in production data. Kroch's insight, the *constant rate hypothesis*, was that for any single abstract process of syntactic change, surface contextual effects tend to be constant across the trajectory of the change. A parsimonious explanation of these facts, Kroch suggested, was that syntactic change applies at an abstract level, that is, affecting structural representations rather than surface strings. Constancy in contextual effects, according to Kroch, reflects the fact that, in the general case, learners faithfully acquire (grammar-external) probabilities over contextual conditions on the use of abstract forms. Grammatical change reflects incremental change in the probability of use of one abstract representation vs. a competing one—"grammar competition" in Kroch's terms. In related work, Guy (1980; 2007) has proposed that within a given dialect, constancy in contextual effects applies across speakers to processes of variation more generally, the *shared constraints hypothesis*. That is, shared probabilistic constraints on variation within a dialect/population are visible not just in diachronic processes but in synchronic variation as well.

Constant rate effects have been reported in a now considerable body of production studies of syntactic change (Santorini, 1993; Ball, 1994; Kroch, 1994; Pintzuk, 1999; Cukor-Avila, 2002; Kallel, 2007; Durham et al., 2011).[1] To date, however, very little work has explored the implications of Kroch's generalization beyond production-based studies of syntactic variation and change. Recent results indicating that acceptability judgments closely mirror relative probabilities of semantically equivalent competing forms in production suggest that constant effects

[1] See also Fruehwald et al. (2009) for evidence of constant rate effects in processes of phonological change.

may also apply in judgment data (Bresnan & Ford, 2010; Melnick et al., 2011). In this article, we propose that controlled judgment data can be used to measure constancy in contextual effects in synchronic variation and to identify different grammars posited by learners (Tortora & den Dikken, 2010). We describe two large-sample judgment experiments lending plausibility to this approach.

The discussion is organized as follows. In section two, we describe an experiment with 297 subjects examining the effect of object weight on word order in English verb particle constructions in American and British English. In section three, we describe effects of voice and object shift on theme-goal ordering in ditransitives in Norwegian, in an experiment with 500 subjects.

2. Object weight effects on word order in particle verb constructions

In this section, we describe a study of regional and grammatical effects on the English particle verb alternation first reported in Haddican & Johnson (2012). We illustrate this variation in (1), which shows that, with a class of transitive verb + particle combinations, the particle may appear either immediately to the right of the verb, before the direct object, or further to the right, following the direct object. We refer to these word orders as the VPO (verb-particle-object) and VOP (verb-object-particle) orders respectively.

(1) a. She cut open the melon. (VPO order)

b. She cut the melon open. (VOP order)

Most formal work on the variation illustrated in (1) takes the two variants to be transformationally related in view of the fact that the thematic interpretations of the two variants are identical. In particular, there are two main approaches to the alternation. One approach takes the VPO order to be underlying, often with the verb and particle merged as a "complex head" taking the object as its complement

(Johnson, 1991; Dehé, 2002). On this approach, the VOP order is typically derived by movement of the object to a position above the V+P complex head, followed by "excorporation" of the verb to a position to the left of the object. A second approach takes the VOP order as underlying, with the object and particle merged in a small clause structure (Kayne, 1985; Den Dikken, 1995, 2010; Svenonius, 2010; Haddican & Johnson, 2014). On this approach, the VPO order is typically derived via raising of the particle into some higher position above the object. The present discussion will not require us to take sides in this debate. For our purposes, what will be crucial is the fairly standard assumption that the variants are related via an abstract process—a movement rule in the syntax.

Much of the formal and sentence processing literature on English particle verbs has focused on two kinds of linguistic constraints on word order. One set of studies has discussed the length, or prosodic weight, of the object as a processing or a phonological phrasing constraint on word order. Kroch & Small (1978); Gries (2001) and Lohse et al. (2004) all report evidence from corpus studies showing that "heavy" objects such as those in (2) tend to favor the VPO order.

(2) a. She turned off the fan I bought her for Valentine's Day. (VPO order)
b. ?She turned the fan I bought her for Valentine's Day off. (VOP order)

With lighter objects as in (3), on the other hand, the VOP order is no longer disfavored.

(3) a. She turned off the fan. (VPO order)
b. She turned the fan off. (VOP order)

Indeed, speakers generally find the VOP order obligatory when the direct object is an unstressed, weak pronoun, as in (4). (Because of the strength of this effect, pronominal objects were not included in the experiment stimuli as described

below.)

(4) a. *She turned off it. (VPO order)

b. She turned it off. (VOP order)

Lohse et al. (2004) explain the object length effect in terms of a more general processing constraint, namely that processing is facilitated when the material intervening between members of a syntactic dependency is minimized. In the case of the VOP order, but not the VPO order, heavy objects as in (3) incur a heavy processing cost, on this approach, because they create a large gap between the two elements in the particle verb dependency. The VPO order is therefore preferred in proportion to increasing object length, not because the VPO order itself becomes easier to process, but because the corresponding VOP order becomes harder to process as object weight increases.

A second set of studies has focused instead on information-structural constraints on word order. Bolinger (1971), Svenonius (1996), Kayne (1998), and Dehé (2002) note that given objects, or topics, favor placement further to the left, as found in the VOP order, while focused objects favor placement further to the right, as in the VPO order. This information-structural effect on particle verb variation is discussed in Haddican & Johnson (2012) and Haddican & Johnson (2014). Here we will focus on the effects of object weight.

A further goal of Haddican & Johnson (2012) was to test Hughes et al.'s (2005) claim of a dialectal difference in word order preference. Based on anecdotal evidence, Hughes et al. (2005: 23) propose that Scottish speakers tend toward VPO, while speakers from the south of England tend toward VOP. Based on limited historical corpus evidence, Elenbaas (2007: 273-279) speculates that in the early Modern English period, VPO was favored in areas most exposed to Scandinavian varieties, that is, the Danelaw in Northern and Eastern parts of

England, while VOP was favored elsewhere.

Haddican & Johnson (2012) suggested that if these claims for British English were true, there might be corresponding differences in American English. For example, if Scotland tends towards VPO, so might areas of the U.S. Midland with heavy Scottish and Scots-Irish settlement patterns. And if Southern England favors VOP, areas mainly settled from there, like New England, might share this preference. In fact, combining the experimental data with geographically-targeted Twitter data, Haddican & Johnson (2012) found no evidence of regional differences within either country, but did find a clear difference between American subjects (who preferred VPO) and British subjects (who preferred VOP). Canadian and Irish subjects were generally intermediate. For this reason, while not excluding the other nationalities, the present study focuses on the American and British subjects, who showed the clearest contrast in this regard.

Subjects. Subjects for the experiment were 297 self-described native speakers of English recruited online through personal contacts of the authors. 126 of these were from Great Britain (England or Scotland), 113 were from the United States, 32 were from Canada and 26 were from Ireland. Almost all had BA/BS-level degrees or higher. Subjects ranged in age from 18 to 84 (mean = 30). 63% were women.

Materials. The experiment crossed three within-subjects factors, each with two levels: particle-object order, object length and focus status of the object. In this report, we will essentially ignore the focus condition.[2] The word-order factor had the levels VPO and VOP, as illustrated in (1) above. Object length was operationalized as a binary factor: "short" objects were all three-syllable constituents with the definite article and a two-syllable noun, e.g. *the melon*; "long" objects were all seven-syllable DPs with a definite article, two two-syllable adjectives and

[2]The effects of word order and object length on acceptability were very similar in the two focus conditions. Any differences between lexicalizations with respect to focus were corrected for, as described below.

a noun, for example *the heavy juicy melon*.

Fully crossing these three binary factors yields eight conditions, but combining the data across the focus factor reduces the number of conditions to four, which we illustrate in (5)–(8).

(5) Her kids wanted a snack, so Andrea cut open the melon.
(VPO order, light object)

(6) Her kids wanted a snack, so Andrea cut open the heavy juicy melon.
(VPO order, heavy object)

(7) Her kids wanted a snack, so Andrea cut the melon open.
(VOP order, light object)

(8) Her kids wanted a snack, so Andrea cut the heavy juicy melon open.
(VOP order, heavy object)

Procedure. 32 lexicalizations were created, using particle verbs that were all non-aspectual and compositional, as classified by Lohse et al. (2004). The lexicalizations were blocked and assigned to lists by Latin square, such that each subject saw all 32 lexicalizations, eight in each of the four conditions. Random assignment of subjects to lists ensured that there was no overall correlation between lexicalization and condition. The 32 experimental sentences in each list were pseudo-randomized within blocks with 32 filler sentences, half grammatical and half ungrammatical.

Subjects judged each of the sentences in a self-paced online judgment experiment using Ibex Farm (Drummond 2011). The experiment was anonymous and subjects were neither paid nor did they receive academic credit for participating. Subjects rated each sentence on an 11-point scale by clicking an icon for a value ranging from 0 to 10 in a horizontal array, with the endpoints labeled "Bad" and

"Good" respectively.

Results and discussion. The data for each subject were normalized by converting to z-scores, subtracting the mean and dividing by the standard deviation of the ratings of the 32 filler sentences. Since half of the fillers were ungrammatical, the experimental sentences with particle verbs tended to have positive z-scores (with an interquartile range between +0.37 and +0.94 units).

Using the lme4 package in R, we then divided the data by focus condition, and fit two separate linear mixed-effects models, with the normalized acceptability judgment as the response, and weight * order (that is, object weight, word order, and their interaction) as fixed effect predictors. This was a maximal random-effects structure, as recommended by Barr et al. (2013).[3]

Since the aim of our paper is to compare the behavior of subjects, the regression models were used to construct estimates of each subject's ratings of each order (VOP and VPO), in each condition. This was done by taking each normalized response and subtracting the random effect estimates (BLUPs) for the appropriate lexicalization. For each condition, each subject's eight adjusted ratings were then averaged. The result thus includes the model's fixed effects, the by-subject random effects, and the residual error.[4]

Figure 1 shows, for each subject, the difference between VOP and VPO order (or the preference for VOP over VPO), with the subject's age represented on the x-axis. Trend lines for heavy and light object conditions for UK and US subjects are also shown.

Figure 1 replicates the effect of object weight discussed in the literature: heavy objects tend to be placed after the particle, while lighter objects tend to precede the particle (Kroch & Small, 1978; Gries, 2001; Lohse et al., 2004). In addition, the

[3]The reason for dividing the data was because the full model with focus * weight * order did not converge. In any case, our results did not differ greatly from a model that simply ignored the focus variable.

[4]We adopted this approach after discovering that using the by-subject BLUPs directly yielded very inconsistent results.

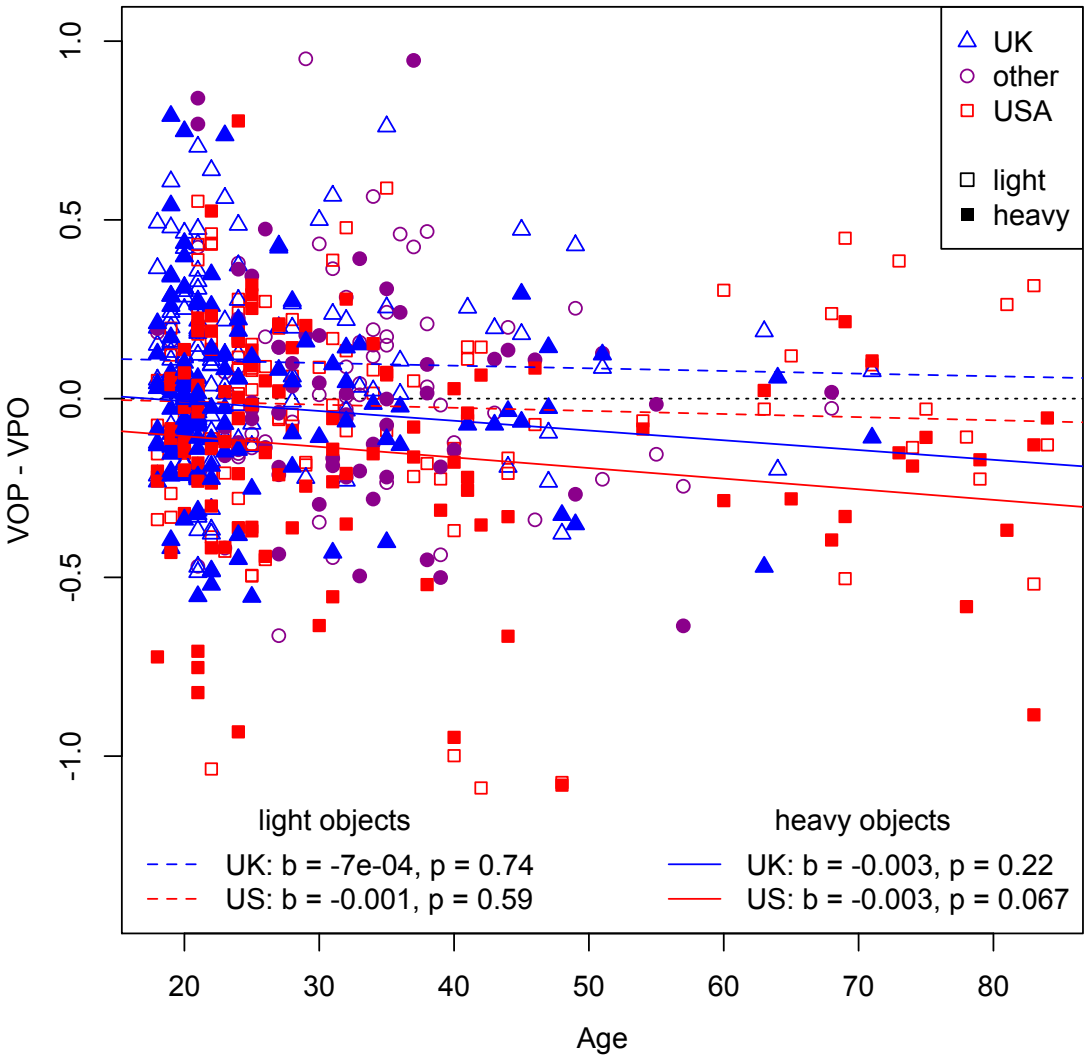

Figure 1: Estimated effects of object weight and word order on acceptability by speaker

figure shows a difference between UK and US subjects; on average, UK subjects tend slightly toward the VOP order, while Americans prefer the VPO order. (See Haddican & Johnson (2012) for a discussion of this difference.) The slopes of the trend lines also show an age effect on word order preference. In both UK and US samples, younger speakers tend toward the VOP order. We return to this fact shortly.

More importantly for our purposes, Figure 1 shows that the object weight effect appears constant, as indicated by the relatively parallel trend lines for heavy and

light objects. (The analysis returned no significant order * weight * age effect; p = .18.) The weight effect therefore seems to be constant in apparent time. In addition, the weight effect is constant between the UK and the US, with very similar slopes for the trend lines between the UK and US samples. (The analysis returned no significant effect for order * weight * country; p = .98) The constant weight effects shown in Figure 1 are predicted if cross-speaker and cross-dialectal variation in preference for VPO vs. VOP orders reflects variation in the probability of application of an abstract process—the movement operation responsible for the particle verb alternation—and probabilistic knowledge of contextual effects on this process, such as the effect of object weight, are acquired by learners independently.

A crucial question that arises from the perspective of this discussion is whether weight affects the acceptability of VPO and VOP orders independently in judgement tasks where these sentence types are treated as separate conditions. Previous acceptability judgment experiments have often enforced an inverse or mirror-image relationship between variants, for example by asking subjects to divide 100 points between two alternative sentences presented together—say 45 to variant A and 55 to variant B (Bresnan & Ford, 2010; Melnick et al., 2011).If an experimental manipulation does not affect the acceptability of variants in an inverse manner—for example, if it affects one variant but not the other—this previous approach will appear to show an inverse relationship anyway. However, comparison of such results with variationist corpus studies has suggested that relative acceptability in judgments does correspond to relative frequency of use (Bresnan & Ford, 2010).

The present experimental approach provides a measure of acceptability of a variant independent of that of competing variants, and thereby allows us to infer distinct effects of contextual variables on those variants.For example, if a certain context increases or decreases the acceptability of only one variant, it can hardly be seen as a constraint on grammar competition. But when the inverse pattern emerges—for example, when effects that favor variant A are seen to independently

disfavor variant B (and ones favoring B disfavor A)—those constraints may well apply to the competition between variants, that is, to the "variable" itself.

In the particle verb data, the mirror pattern that emerges is only partial. Object weight affects both orders of the English particle verb alternation, but increasing the weight of the object from two to four words (or from three to seven syllables) disfavors the Verb-Object-Particle order about 50% more than it favors the Verb-Particle-Object order.[5] We illustrate this in Table 1, showing the effects of weight on VOP and VPO orders. The greater effect of object weight in the VOP order is also reflected in the greater distance between the two trend lines in the left panel of Figure 2 (VOP), compared to the right panel (VPO).

Object Weight	**Verb-Object-Particle**	**Verb-Particle-Object**
Light	0.618	0.575
Heavy	0.553	0.617
$\|\Delta\|$	0.065	0.042

Table 1: Average acceptability for four conditions

These results are partially explained by Lohse et al.'s (2004) processing-based account, where the weight effect is taken to reflect a preference by the processor to resolve dependency relations in a maximally local domain. Heavy objects are dispreferred in the VOP frame, according to this approach, because the object NP material intervening between the verb and its associated particle entails a "non-minimal domain" for processing (see also Hawkins (2004)).

However, the fact that object weight has an effect on the VPO order is unexpected from this perspective, since a larger object noun phrase should have no effect at all on the size of the processing domain for the relevant dependency relation.[6] In our experiment's VPO condition, "the smallest contiguous substring

[5]This calculation assumes that object weight itself has no overall effect on acceptability, an assumption we aim to test explicitly in future experiments.

[6]A reviewer points out that if object length (or another experimental manipulation) has an

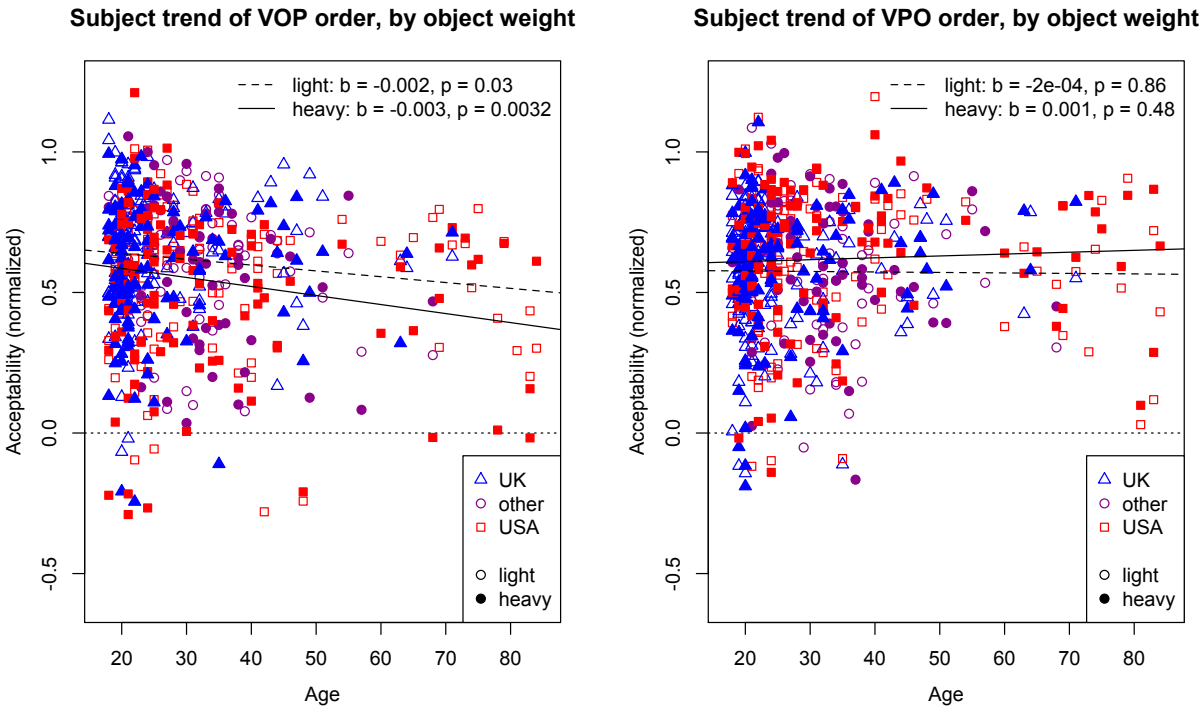

Figure 2: Estimated effects of object weight on acceptability of VOP and VPO orders by speaker

containing the verb, the particle, and the first constructing word in the object NP" (Lohse et al. 2004: 240) is the same length—indeed, is identical—in both light-object and heavy-object conditions.

This suggests that when subjects evaluate the acceptability of a given syntactic structure, they may implicitly compare it with a competing structure in the same environment. That is, the well-motivated weight effect disfavoring heavy objects in the VOP order may lead to a preference for heavy objects in the VPO order. Subjects may evaluate the relative acceptability of both orders when they are exposed to either one of them, in a kind of perceptual version of competing grammars. At the same time, the fact that object weight has a smaller effect in the VPO condition may reflect it being parasitic on the effect in the VOP condition.

overall effect on the acceptability of sentences, it would impair our ability to independently assess its effects on the VPO and VOP orders. We agree that the improvement seen for heavy objects in the VPO order is unlikely to be due to an overall preference for heavy objects, while taking the reviewer's point that such effects should be controlled for in future experiments.

If the variants show a partially-inverse relationship on average, a clear independence between them is visible in diachrony. Over the twentieth century, in both the US and the UK, there was a slow shift in particle verb realization in the direction of the VOP order (Haddican & Johnson, 2012). Figure 2 shows that this shift has been driven almost entirely by an increase in the acceptability of the VOP order, without any concomitant decline in the acceptability of the VOP order. Relatedly (though not illustrated in Figure 2), the VOP order is clearly preferred in the UK compared to the US, while the VPO order has similar levels of acceptability in the two countries. (See Campbell-Kibler (2011) for similar evidence of the perceptual independence of variants in phonology.) Corpus studies must necessarily treat any change, like any constraint, as applying to the variable—to the relationship between variants. The present results from a judgement study, in which acceptability of the different variants are measured independently, suggests, instead that depending on the variable, or the constraint, speakers' base rates of variation, and the competition between the variants, may not be governed by a single abstract probability. Rather, probabilistic knowledge of contextual effects may be represented separately for separate variants. The results presented in this section, however, suggest that these effects are relatively constant across speakers, a finding in keeping with Kroch's generalization.[7]

3. Shape conservation effects in Norwegian

The second experiment we discuss comes from a study on object ordering in Norwegian. Norwegian is a "symmetric passive" language, meaning that in passives of double object constructions, both theme and goal arguments may passivize, as

[7]To clarify, when we say a given effect is constant across the speakers in our study, we do not mean that the speakers display no variability. For one thing, our data is noisy, partially because of the rough 0-10 scale, and no amount of statistical manipulation can completely correct for this. A less rigorous operationalization of a "constant effect" on a variable is that the size of the effect should be statistically independent of a speaker's input probability. All the effects reported in this paper meet this criterion.

illustrated in (9).

(9) ***Norwegian***

a. Jens ble gitt bok-en.
Jens was given book-the
'Jens was given the book.'

b. Bok-en ble gitt Jens.
Book-the was given Jens
'The book was given (to) Jens.'

(Adapted from Haddican & Holmberg (2012))

In this respect, Norwegian differs from Danish—an "asymmetric passive" language—where only goal arguments may passivize in double object constructions:

(10) ***Danish***

a. Jens blev givet bog-en.
Jens was given book-the
'Jens was given the book.'

b. *Bog-en blev givet Jens.
Book-the was given Jens
'The book was given (to) Jens.'

(Holmberg & Platzack, 1995)

Anagnostopoulou (2003, 2005) proposed that the difference between Norwegian and Danish illustrated in (9) and (10) is relatable to a further difference between the two languages in terms of object ordering in object shift (OS) constructions in these languages. OS refers to contexts where weak pronominal objects—but not other VP material—raise out of the verb phrase. We illustrate this in (11) where the object pronoun raises out of the VP, to a position to the left of the negative adverbial, *ikke*.

(11) Elsa så den ikke [$_{VP}$ ~~så den~~.]
Elsa saw it not

'Elsa didn't see it.'

Importantly, OS in Scandinavian languages is restricted to contexts where the verb raises out of the VP as well—a restriction known as *Holmberg's Generalization* (Holmberg, 1986). (12), for example, shows that in perfect contexts, where the verb must remain inside the VP, OS is also blocked.

(12) ***Holmberg's Generalization (HG)***

a. Elsa har ikke gitt ham den.
Elsa has not given him it
'Elsa hasn't given him it.'

b. *Elsa har ham den ikke [$_{VP}$ gitt ~~ham~~ ~~den~~.]
Elsa has him it not given
'Elsa hasn't given him it.'

In sentences with object shift, the theme-goal order is strictly disallowed in Danish, while in Norwegian, some speakers marginally allow it, as illustrated in (13) and (14).

(13) ***Danish double object OS***

a. Peter viste hende den jo.
Peter showed her it indeed
'Peter indeed showed it to her.'

b. *Peter viste den hende jo.
Peter showed it her indeed
'Peter indeed showed it to her.'

(Anagnostopoulou, 2005)

(14) ***Norwegian double object OS***

a. Elsa ga ham den ikke.
Elsa gave him it not
'Elsa didn't give him it.'

b. %Elsa ga den ham ikke.
Elsa gave it him not

'Elsa didn't give him it.'

(Haddican & Holmberg, 2012)

Anagnostopoulou proposed that this cross-linguistic correlation in the availability of theme-goal orders in passives and OS has an abstract source: the same short theme movement responsible for theme-goal orders in OS constructions in Norwegian feeds passivization, as shown in (15). In Danish, where this short theme movement is not available, theme passivization is blocked by the intervening goal. On this approach, then, the unavailability of theme-passivization in asymmetric passive languages is explained as a locality effect.

(15) ***Theme passivization on the locality approach***

$[_{TP}$ Theme T $[_{vP}$ v $[_{XP}$ ~~Theme~~ $[_{XP}$ Goal $[_{YP}$ ~~Theme~~]]]]]

As Anagnostopoulou noted, acceptability of theme-goal orders varies across speakers of Norwegian. The above locality approach therefore makes a strong prediction about this cross-speaker variation: speakers should accept the theme-goal order in passives if and only if they also accept the theme-goal order in OS. Below, we describe a judgment experiment designed to test this prediction.

Subjects. Participants were 500 self-described native speakers of Norwegian, aged 18-81 (M=38.9, SD=11.5), 371 women and 129 men. Participants were recruited online and were not compensated. We did not require participants to be linguistically naive.

Materials. The experiment was a 2x3 design crossing argument order (with levels *theme-goal* and *goal-theme*) with context (with levels *Passive*, *Active-OS* and *Active-non-OS*). The Active-non-OS condition was included to test Anagnostopoulou's (2003) claim that the theme-goal order is degraded in such contexts. We illustrate these six conditions in Table 2.

All theme and goal arguments were third person pronouns. We biased theme

Context	theme-goal	goal-theme
Passives	Den ble gitt ham. 'It was given (to) him.'	Han ble gitt den. 'He was given it.'
Active OS	Elsa ga den ham ikke. 'Elsa didn't give it (to) him.'	Elsa ga ham den ikke. 'Elsa didn't give him it.'
Active-non-OS	Elsa har ikke gitt den ham. 'Elsa hasn't given it (to) him.'	Elsa har ikke gitt ham den. 'Elsa hasn't given him it.'

Table 2: Example sentences for six conditions

vs. goal interpretation of the arguments using animate pronouns for goal arguments and inanimates for themes. Twelve lexicalizations were created for each of the conditions. These were then blocked and assigned to lists by Latin square. Each subject saw four items/condition, yielding 24 critical items, which were pseudo-randomized with 24 fillers, half of which were grammatical and half ungrammatical. Subjects were pseudo-randomly assigned to lists, using a counter mechanism.

Procedure. Subjects judged the above materials in a self-paced, web-based survey in Spring 2013 using Ibex Farm (Drummond, 2013). Subjects judged each sentence one-by-one and were not permitted to view or rejudge previously judged items. Subjects rated each sentence on an 11-point (0-10) scale by clicking an icon for a value ranging from 0 to 10 in a horizontal array, with endpoints labeled *dårlig* 'bad' and *god* 'good'. Results were normalized by converting to z-scores based on by-speaker means and standard deviations of fillers.

Results and discussion. Figure 3 plots mean scores and 95% confidence intervals for our six conditions. Zero on the y-axis corresponds to the mean scores for the fillers, half of which, again, were grammatical and half ungrammatical. Zero on the y-axis might therefore be taken as a rough midpoint of acceptability. The figure shows that theme-goal orders are quite bad in the active conditions. The theme-goal order is particularly degraded in the Active-non-OS condition (Anagnostopoulou, 2003), the same environment where the goal-theme order is rated highest, an effect to which we return shortly. In the object shift condition,

the goal-theme order is rated somewhat lower and the theme-goal order is less sharply degraded. In passives, the theme-goal order was judged much better than in the other contexts—substantially better, in fact, than the goal-theme order.

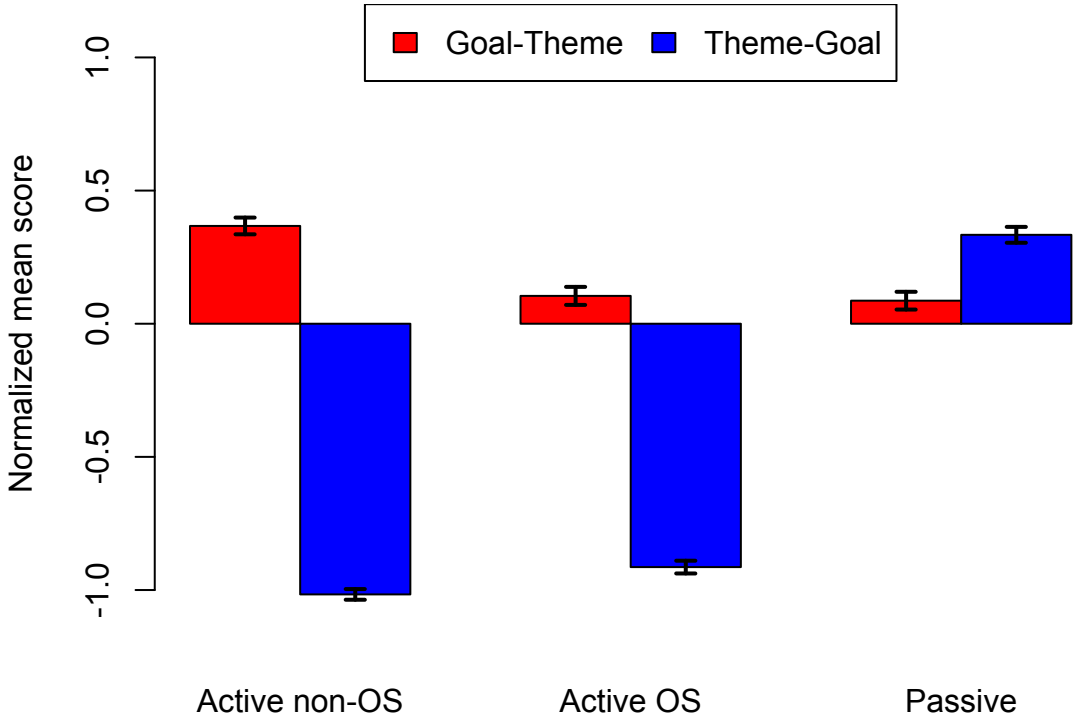

Figure 3: Mean scores and 95% CIs for six conditions

Figure 4 illustrates subjects' word-order preferences in two pairs of contexts. The x-axis shows each subject's preference in the Active-non-OS context—that is, subtracting each speaker's estimate for the Goal-Theme order from their estimate for the Theme-Goal order. The y-axis shows the same contrast for the Active-OS context (in blue) and the Passive context (in red). The blue triangles, therefore, show the correlation of word-order preferences between Active-non-OS and Active-OS sentences, and the red triangles show the correlation between Active-non-OS sentences and Passive sentences. There is a fairly high positive correlation (+0.570) between the two active contexts, and no significant correlation between the Active-non-OS and Passive contexts.

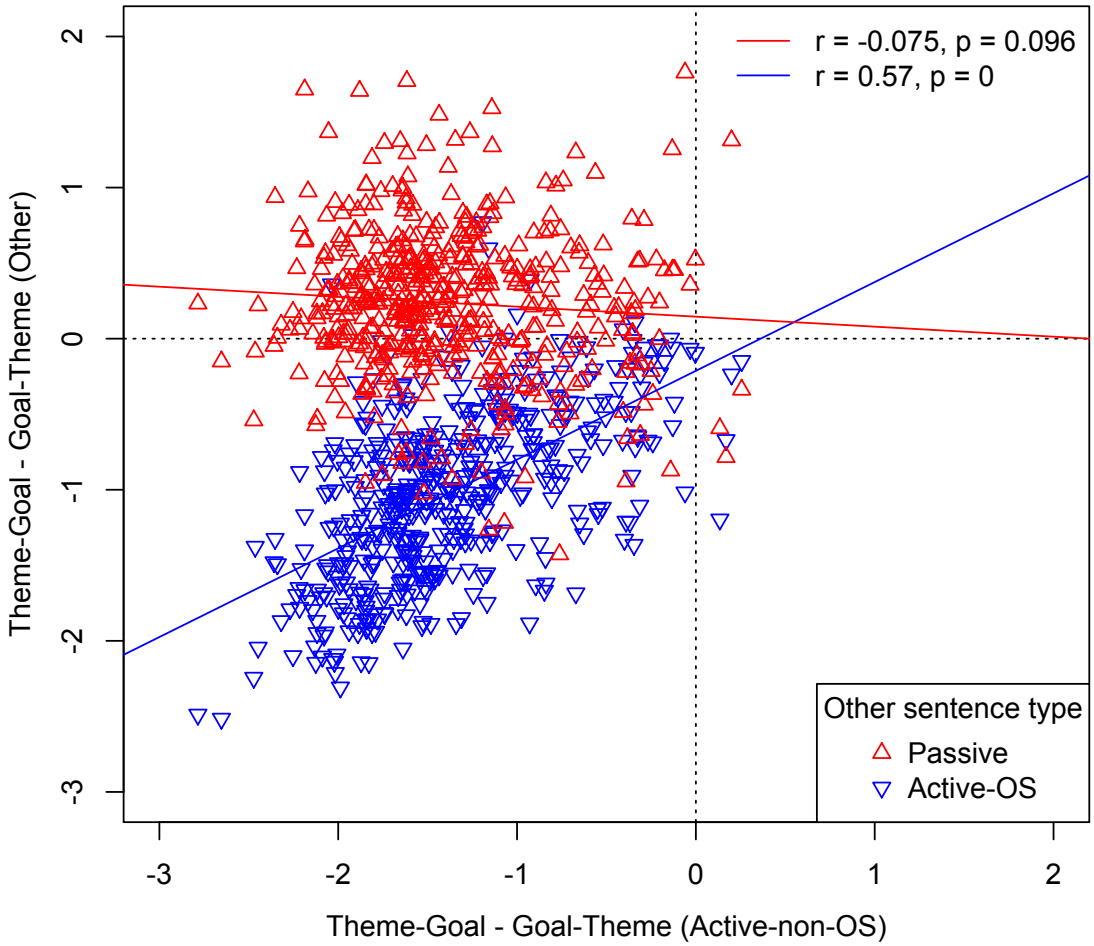

Figure 4: Preference for Theme-Goal over Goal-Theme order (Passive and Active-OS compared to Active-non-OS)

Figure 4 therefore suggests that an individual's acceptance of the theme-goal order in Active-non-OS contexts is a poor predictor of their acceptance of the theme-goal order in passives, contra the locality approach discussed above. The results, however, do suggest a relationship between the acceptance of theme-goal orders in the two active contexts. Haddican & Holmberg (2014) suggest that this is an order preservation effect, whereby certain movement operations—OS, in this case—may not change the linear order of syntactic objects established at a prior level (Sells, 2001; Richards, 2004; Fox & Pesetsky, 2005; Engels & Vikner, 2013). Specifically, Haddican & Holmberg (2014) propose that the same VP-internal movement operation responsible for the theme-goal order in Active-non-

OS contexts also feeds OS. The cross-speaker correlation in scores for these two environments reflects this fact. To the extent that speakers allow the movement operation, they will also allow theme-goal order in OS; to the extent the movement is unavailable, theme-goal order in OS will also be blocked. Importantly, this object order preservation effect applies in the same environments (OS contexts) as Holmberg's generalization effects, which preserves the relative order of verbs and objects (see (12), above). We refer readers to Haddican & Holmberg (2014) for details on the implementation of this proposal, and an alternative analysis of theme-passivization in these varieties.

The importance of these results for Kroch's generalization is that they indicate stability in contextual effects on judgments across speakers, although acceptance of the abstract rule—a VP-internal movement operation according to Haddican & Holmberg (2014)—varies considerably across speakers. This is precisely the pattern expected if, as Kroch suggests, learners within a given dialect/community faithfully acquire probabilities over contextual conditions on the use of abstract forms.

Recall from the discussion of the English particle verb data that the effect of weight on the VPO order *partially* mirrors its effect on the VOP order: relative to light objects, heavy objects disfavor the VOP order and favor the VPO order, but the former effect is stronger than the latter. A question that arises in this light is whether the acceptability of Norwegian goal-theme and theme-goal word orders are affected differently by OS. Table 3, which summarizes the effects on OS in theme-goal and goal-theme contexts, shows that these effects are in a mirroring relationship with a greater asymmetry: object shift disfavors the goal-theme order more than twice as strongly than it favors the theme-goal order.[8]

[8]A reviewer notes that when judgments for two conditions fall mainly near one endpoint of the measurement scale (as for the Norwegian active theme-goal sentences), the difference in acceptability between them may be harder to measure. The point deserves further investigation, but we are not dealing with a classic "floor effect" here. Only 118/500 subjects (23.6%) gave the theme-goal stimuli the lowest possible ratings in the Active-OS context, a figure which only

Context	Theme-Goal	Goal-Theme
Active OS	-0.914	0.115
Active-non-OS	-1.017	0.373
$\|\Delta\|$	0.103	0.258

Table 3: Average acceptability for four conditions

In discussing the degradation of theme-goal order in non-OS contexts compared to OS contexts, Anagnostopoulou (2003) proposes that the short theme movement responsible theme-goal order is only licit when it feeds a subsequent movement step, OS or passivization (see also Richards (1997:127-162).) The results summarized in figure 4 does not support Anagnostopoulou's description, since many subjects in our sample accept theme-goal orders to a degree in active non-OS contexts. The fact that the theme-goal order is *relatively* worse in non-OS contexts than OS contexts is in line with Anagnostopoulou's proposal. Whatever the source of the degradation of theme-goal order in non-OS contexts, it bears observing that it co-occurs with a stronger *increase* in acceptability of the competing word order—Goal-Theme. The fact that OS has an opposing effect on the two word orders again suggests that subjects may judge structures in light of contextual restrictions on *competing* variants. Unlike the object weight effect on particle verbs, however, whose greater effect on the VOP order had a principled explanation, the fact that OS should have a stronger effect on goal-theme than theme-goal orders is something we cannot account for here.

In the particle verb experiment, younger subjects gave more favorable judgments to the VOP order, while judgments of the VPO order were surprisingly stable (Figure 2). An age effect was also observed for the Norwegian experiment, in the Passive condition. Figure 5 shows that as the theme-goal order is judged worse among younger speakers, the goal-theme order is judged better. The size of the age effect is similar for both conditions, as shown by the trend lines (the

increased to 161/500 (32.2%) in the Active-non-OS context.

absolute values of the trends are not significantly different; p = .26).

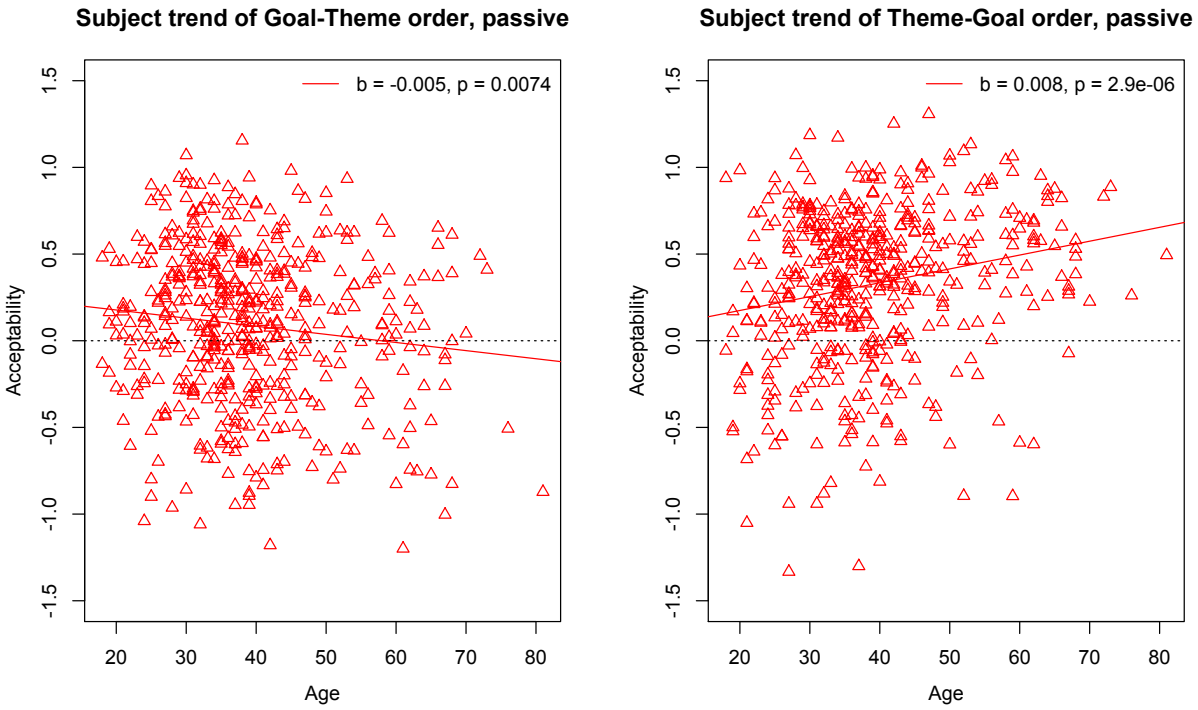

Figure 5: Acceptability of goal-theme and theme-goal word orders in Passive contexts by speaker

To summarize, we have seen evidence that in the light of acceptability judgment data, "grammar competition" is not a single phenomenon. In some cases, we do find the expected pattern: contextual or between-speaker effects have mirror-image—that is, inverse—consequences on the two variants (assuming a binary competition). An example is the apparent-time change in the passive of the Norwegian double object construction.For other effects, like object weight in the English particle verb alternation or object shift in the active voice of the Norwegian double object, our experiments found a strong change for one of the variants, while the other showed a much weaker change in the opposite direction. We suggest that in these cases, there may be a principled explanation for the larger effect, while the other effect derives from it through an implied comparison of the two variants (even though the experimental task is only to judge one sentence).A third situa-

tion is where only one variant is affected, like the overall apparent-time change in the English particle verbs. Further research will examine how general these three types of variant (in)dependence are in judgment data, and explore the reasons why a given effect on a given variable follows one of these three patterns, rather than another.

4. Conclusion

Kroch's generalization about the constancy of conditioning effects in production data originally held the promise of a new kind of data capable of informing formal analysis by equipping formalists "to refine grammatical analyses on the basis of the predictions they make about the patterning of usage in change" (Kroch 1989). In practice, the application of this technique to formal issues has been fairly limited owing to the difficulty of finding appropriate corpora, and the time required to analyze such data. In addition, identifying the intended interpretation of a given string in production data may add uncertainty to formal analyses of usage data.

In this paper, we have argued that controlled judgment experiments provide an additional technique for inferring a single abstract source for superficially different forms, using Kroch's generalization. Recent advances in techniques for carrying out web-based experiments now make such experiments relatively easy to implement. Future work in comparative syntax might therefore avail itself of these new techniques.

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